A Preliminary Assessment

of

Pigeon Point Landfill

EPA No. DE-27

Emergency and Remedial Response Information System

Grant No. X-003282-01-0

March, 1984

Presented to: Mr. E. Skernolis, Acting Chief, Site Investigation & Support Section, U.S. EPA, Region III

Prepared by: Delaware Department of Natural Resources and Environmental Control, Solid Waste Branch

Andrew Bullen, ERRIS Investigator

Robert Pickert, ERRIS Coordinator

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ORIGINAL
(Red)

I. Introduction

Inquiry Source

Eckhardt List, 1979

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Summary

Pigeon Point Landfill, located along the Delaware River just north of the west bound span of the Delaware Memorial Bridge, has been used for the disposal of municipal and industrial waste from 1971 until the present.[1] Between forty and fifty years prior to landfilling, this 187 acre site was used by the Army Corps of Engineers to dispose of dredge spoils from the Christina and Delaware Rivers.[2] Since its opening, all municipal waste from new Castle County have been landfilled at Pigeon Point.* Plans for closure and covering of the landfill will be implemented in early 1985 by the Delaware Solid Waste Authority (DSWA).6 Municipal and industrial sludges were not accepted at Pigeon Point after Nov. 19, 1980. Other industrial wastes disposed of here include: paint pigments and sludges, metal sludges, petroleum refinery wastes, PVC wastes, chemical process wastes, polylene and phenol-resins.[1&4] Control and operation of the landfill was transferred from the county to the DSWA on Jan. 1, 1981.[5] Prior to the transfer the county had installed leachate collection system for the eastern portion of the landfill; since that time DSWA has completed a leachate collection system for the western portion.[7] Ground water monitoring is conducted through test wells in all the aquifers beneath the landfill.[3,4&5]

Recommendation

Since the Pigeon Point Landfill has an adequate leachate collection and monitoring well system and the DSWA is required to maintain and monitor this facility after its closure, no further action is required under the ERRIS program.

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II. Site History

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Permits

Pigeon Point operates under a Solid Waste Disposal permit from the Department of Natural Resources and Environmental Control.[5]

Site Owner

The Pigeon Point Landfill was turned over to the Delaware Solid Waste Authority on January 1, 1981. New Castle County owned the land prior to this time.

Area Residents

No area residents were contacted during this preliminary assessment.

Media Coverage

No media coverage was found in the News Journal library concerning the operation of Pigeon Point Landfill.

Enforcement Status

No regulatory action has ever been taken against the DSWA or New Castle County concerning this operation and maintenance of Pigeon Point by the Department of Natural Resources and Environmental Control.

III. Environmental Setting

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Surface Water

Pigeon Point Landfill is bordered by both the Christina River on the north and the Delaware River on the south. In the past leachate was allowed to flow directly into the Delaware River from the landfill. This practice ceased when the county constructed the eastern portion of the leachate collection system in 1980.

Groundwater

The Columbia and Potomac formations below the landfill both produce considerable amounts of water. Analysis from the monitoring wells at Pigeon point show that the Columbia aquifer is severely contaminated with metals. The Potomac aquifer is somewhat less contaminated.[3&4] The water table aquifer occurs within the marsh/hyperulic fill material normally within 20 ft. of the surface of the landfill. See Appendix C for more detail of the ground water quality and elevation. The DNREC has monitored the affects of the landfill contaminating the adjacent production wells at ICI, Americas,Inc. No relationship was established.[9]

Geology and Soils

The original surface material at Pigeon Point were recently deposited marsh and overlying silts and sands of the Columbia formation. Beneath the Columbia formation lies the Potomac formation which overlies the Crystaline Bedrock. Dredge spoils from the Delaware River were deposited over the entire site to a depth of 10-20 ft. by the Army Corps of Engineers from 1920 until 1970. The fill material was deposited on top of the dredge spoils (see geologic cross-section in Appendix A) to a maximum depth of 40 ft. The average depth of the fill material is approximately 20 ft.[2]

Land Use

The land adjacent to Pigeon point landfill is used primarily for general industry. There are residents within one mile of the landfill.

Population Distribution

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Less than 1,000 people reside within one mile of the Pigeon Point Landfill in addition to several hundred which work at adjacent industrial sites.

Water Supply

Water in the vicinity of the landfill is supplied by Wilmington Suburban and the City of Wilmington. The closest production well is located 1.5 miles to the southwest of Pigeon Point.

Critical Environment

State wetlands are located within 1/2 mile of the Pigeon Point Landfill boundary. There is no evidence that they have been affected by the landfill.

Additional Information

Closure Plans - The Pigeon Point Landfill will be completed and closed by mid-1985. All solid waste will then be disposed at the New Cherry Island landfill. The landfill will be closed section by section as they are filled. This process has already started (see maps). The final cover will consist of a total of two feet of clean fill. This could constitute a variety of combination of material. The most probable will be the following:

first six inches of daily cover, covered with 6 inches of Type G fill (a silt-clay subsoil), followed by a mix of 50 percent Type G and 50 percent humus produced at the recovery plant.

If grass does not take well in the 50-50 mix the following cover will be used:

six inches daily cover, followed by 12 inches of the 50-50 mix with 6 inches of top soil on the surface.[6]

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IV. Preliminary Assessment Form

EPA

POTENTIAL HAZARDOUS WASTE SITE
IDENTIFICATION AND PRELIMINARY ASSESSMENT

REGION	SITE NUMBER (to be assigned by Hq)
III	DE-27

NOTE: This form is completed for each potential hazardous waste site to help set priorities for site inspection. The information submitted on this form is based on available records and may be updated on subsequent forms as a result of additional inquiries and on-site inspections.

GENERAL INSTRUCTIONS: Complete Sections I and III through X as completely as possible before Section II *(Preliminary Assessment)*. File this form in the Regional Hazardous Waste Log File and submit a copy to: U.S. Environmental Protection Agency; Site Tracking System; Hazardous Waste Enforcement Task Force *(EN-335)*; 401 M St., SW; Washington, DC 20460.

I. SITE IDENTIFICATION

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A. SITE NAME: Pigeon Point Landfill

B. STREET *(or other identifier)*: Pigeon Point Road

C. CITY: New Castle

D. STATE: DE

E. ZIP CODE: 19720

F. COUNTY NAME: New Castle

G. OWNER/OPERATOR *(if known)*

1. NAME: Delaware Solid Waste Authority - DSWA
2. TELEPHONE NUMBER: 302-736-5361

H. TYPE OF OWNERSHIP

☐ 1. FEDERAL ☒ 2. STATE ☐ 3. COUNTY ☐ 4. MUNICIPAL ☐ 5. PRIVATE ☐ 6. UNKNOWN

I. SITE DESCRIPTION

state owned & operated municiple landfill for New Castle County

J. HOW IDENTIFIED *(i.e., citizen's complaints, OSHA citations, etc.)*: Eckhardt List - DNREC - Solid Waste Branch

K. DATE IDENTIFIED *(mo., day, & yr.)*: 1979

L. PRINCIPAL STATE CONTACT

1. NAME: Robert Pickert, DNREC - Solid Waste Branch
2. TELEPHONE NUMBER: 302-736-4781

II. PRELIMINARY ASSESSMENT *(complete this section last)*

A. APPARENT SERIOUSNESS OF PROBLEM

☐ 1. HIGH ☐ 2. MEDIUM ☐ 3. LOW ☒ 4. NONE ☐ 5. UNKNOWN

B. RECOMMENDATION

☒ 1. NO ACTION NEEDED *(no hazard)*

☐ 2. IMMEDIATE SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR: _____
b. WILL BE PERFORMED BY: _____

☐ 3. SITE INSPECTION NEEDED
a. TENTATIVELY SCHEDULED FOR: _____
b. WILL BE PERFORMED BY: _____

☐ 4. SITE INSPECTION NEEDED *(low priority)*

C. PREPARER INFORMATION

1. NAME: Andrew Bullen, DNREC
2. TELEPHONE NUMBER: 302-736-4781
3. DATE *(mo., day, & yr.)*: 2/21/84

III. SITE INFORMATION

A. SITE STATUS

☒ 1. ACTIVE *(Those industrial or municipal sites which are being used for waste treatment, storage, or disposal on a continuing basis, even if intermittently.)* Until 1985

☐ 2. INACTIVE *(Those sites which no longer receive wastes.)*

☐ 3. OTHER *(specify)*: _____ *(Those sites that include such incidents like "midnight dumping" where no regular or continuing use of the site for waste disposal has occurred.)*

B. IS GENERATOR ON SITE?

☒ 1. NO ☐ 2. YES *(specify generator's four-digit SIC Code)*: _____

C. AREA OF SITE *(in acres)*: 187 acres - 136 used

D. IF APPARENT SERIOUSNESS OF SITE IS HIGH, SPECIFY COORDINATES

1. LATITUDE *(deg.-min.-sec.)*: 39° 42' 10"
2. LONGITUDE *(deg.-min.-sec.)*: 75° 32' 00"

E. ARE THERE BUILDINGS ON THE SITE?

☐ 1. NO ☒ 2. YES *(specify)*: _____

Continue On Reverse

Continued From Front

V. CHARACTERIZATION OF SITE ACTIVITY

Indicate the major site activity(ies) and details relating to each activity by marking 'X' in the appropriate boxes.

A. TRANSPORTER	B. STORER	C. TREATER	D. DISPOSER
1. RAIL	1. PILE	1. FILTRATION	X 1. LANDFILL
2. SHIP	2. SURFACE IMPOUNDMENT	2. INCINERATION	2. LANDFARM
3. BARGE	3. DRUMS	3. VOLUME REDUCTION	3. OPEN DUMP
4. TRUCK	4. TANK, ABOVE GROUND	4. RECYCLING/RECOVERY	4. SURFACE IMPOUNDMENT
5. PIPELINE	5. TANK, BELOW GROUND	5. CHEM./PHYS. TREATMENT	5. MIDNIGHT DUMPING
6. OTHER (specify):	6. OTHER (specify):	6. BIOLOGICAL TREATMENT	6. INCINERATION
		7. WASTE OIL REPROCESSING	7. UNDERGROUND INJECTION
		8. SOLVENT RECOVERY	8. OTHER (specify):
		9. OTHER (specify):	

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E. SPECIFY DETAILS OF SITE ACTIVITIES AS NEEDED

Accepts domestic garbage and non-hazardous industrial waste for all of New Castle County. Has a complete leachate collection and monitoring well system.

V. WASTE RELATED INFORMATION

A. WASTE TYPE

☐ 1. UNKNOWN ☐ 2. LIQUID ☒ 3. SOLID ☒ 4. SLUDGE ☐ 5. GAS

B. WASTE CHARACTERISTICS

☐ 1. UNKNOWN ☐ 2. CORROSIVE ☐ 3. IGNITABLE ☐ 4. RADIOACTIVE ☐ 5. HIGHLY VOLATILE
☐ 6. TOXIC ☐ 7. REACTIVE ☐ 8. INERT ☐ 9. FLAMMABLE

☒ 10. OTHER (specify): Toxic waste has been dumped in the past

C. WASTE CATEGORIES

1. Are records of wastes available? Specify items such as manifests, inventories, etc. below.

2. Estimate the amount (specify unit of measure) of waste by category; mark 'X' to indicate which wastes are present.

a. SLUDGE	b. OIL	c. SOLVENTS	d. CHEMICALS	e. SOLIDS	f. OTHER
AMOUNT	AMOUNT	AMOUNT	AMOUNT	AMOUNT	AMOUNT
UNIT OF MEASURE	UNIT OF MEASURE	UNIT OF MEASURE	UNIT OF MEASURE	UNIT OF MEASURE	UNIT OF MEASURE
X (1) PAINT, PIGMENTS	(1) OILY WASTES	(1) HALOGENATED SOLVENTS	(1) ACIDS	(1) FLYASH	(1) LABORATORY PHARMACEUT.
(2) METALS SLUDGES	(2) OTHER (specify):	(2) NON-HALOGNTD. SOLVENTS	(2) PICKLING LIQUORS	(2) ASBESTOS	XX (2) HOSPITAL
(3) POTW		X (3) OTHER (specify): midnight dumping of toluene	(3) CAUSTICS	(3) MILLING/ MINE TAILINGS	(3) RADIOACTIVE
(4) ALUMINUM SLUDGE			(4) PESTICIDES	(4) FERROUS SMLTG. WASTES	X (4) MUNICIPAL
(5) OTHER (specify):			(5) DYES/INKS	(5) NON-FERROUS SMLTG. WASTES	(5) OTHER (specify):
			(6) CYANIDE	X (6) OTHER (specify): domestic waste 1500/tons/day 1971-1985	
			(7) PHENOLS		
			(8) HALOGENS		
			(9) PCB		
			(10) METALS		
			(11) OTHER (specify)		

Continue On Page 3

V. WASTE RELATED INFORMATION (continued)

3. LIST SUBSTANCES OF GREATEST CONCERN WHICH MAY BE ON THE SITE (place in descending order of hazard).

Industrial sludges, (paint, metals), toluene (midnight dumping)

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4. ADDITIONAL COMMENTS OR NARRATIVE DESCRIPTION OF SITUATION KNOWN OR REPORTED TO EXIST AT THE SITE.

This landfill was poorly operated during the early 1970's, presently it is very well managed with a complete waste recovery system. Will be closed in early 1985.

VI. HAZARD DESCRIPTION

A. TYPE OF HAZARD	B. POTENTIAL HAZARD (mark 'X')	C. ALLEGED INCIDENT (mark 'X')	D. DATE OF INCIDENT (mo., day, yr.)	E. REMARKS
1. NO HAZARD				
2. HUMAN HEALTH	X			Potential existed in the past
3. NON-WORKER INJURY/EXPOSURE				
4. WORKER INJURY				
5. CONTAMINATION OF WATER SUPPLY				
6. CONTAMINATION OF FOOD CHAIN				
7. CONTAMINATION OF GROUND WATER	X			Due mostly to dredge spoils
8. CONTAMINATION OF SURFACE WATER		X		Exist in the past. Leachate discharged to the Delaware River
9. DAMAGE TO FLORA/FAUNA				
10. FISH KILL				
11. CONTAMINATION OF AIR		X		Past fires at the site
12. NOTICEABLE ODORS				
13. CONTAMINATION OF SOIL				
14. PROPERTY DAMAGE				
15. FIRE OR EXPLOSION		X		Fires during union strikes in the past.
16. SPILLS/LEAKING CONTAINERS/ RUNOFF/STANDING LIQUIDS				
17. SEWER, STORM DRAIN PROBLEMS				
18. EROSION PROBLEMS		X		Some erosion noted on dikes surrounding landfill
19. INADEQUATE SECURITY		X		Past incidents
20. INCOMPATIBLE WASTES				
21. MIDNIGHT DUMPING		X		Past incidents
22. OTHER (specify):				

Continue On Reverse

VII. PERMIT INFORMATION

A. INDICATE ALL APPLICABLE PERMITS HELD BY THE SITE.

☐ 1. NPDES PERMIT ☐ 2. SPCC PLAN ☒ 3. STATE PERMIT (specify): solid waste permit

☐ 4. AIR PERMITS ☐ 5. LOCAL PERMIT ☐ 6. RCRA TRANSPORTER

☐ 7. RCRA STORER ☐ 8. RCRA TREATER ☐ 9. RCRA DISPOSER

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☐ 10. OTHER (specify): _____

B. IN COMPLIANCE?

☒ 1. YES ☐ 2. NO ☐ 3. UNKNOWN

4. WITH RESPECT TO (list regulation name & number): _____

VIII. PAST REGULATORY ACTIONS

☒ A. NONE ☐ B. YES (summarize below)

IX. INSPECTION ACTIVITY (past or on-going)

☐ A. NONE ☐ B. YES (complete items 1,2,3, & 4 below)

1. TYPE OF ACTIVITY	2. DATE OF PAST ACTION (mo., day, & yr.)	3. PERFORMED BY: (EPA/State)	4. DESCRIPTION
site inspection	1980	EPA	

X. REMEDIAL ACTIVITY (past or on-going)

☐ A. NONE ☐ B. YES (complete items 1, 2, 3, & 4 below)

1. TYPE OF ACTIVITY	2. DATE OF PAST ACTION (mo., day, & yr.)	3. PERFORMED BY: (EPA/State)	4. DESCRIPTION

NOTE: Based on the information in Sections III through X, fill out the Preliminary Assessment (Section II) information on the first page of this form.

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V. Field Trip Summary Report

FIELD TRIP SUMMARY REPORT

This summary should be prepared in conjunction with the Preliminary Assessment Form, (EPA Form T2070-2), so that a proper site rating can be assigned.

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Name of Site Pigeon Point Landfill

EPA Case Number DE-27

TDD Number _____

I. If site is active, has owner/operator notified EPA in accordance with Section 3010 of RCRA. Yes ___ No X

If Yes: a) Note EPA I.D. No. _____
b) Is the site a generator, storer, treater or disposer of hazardous waste? (CIRCLE ONE).

II. If the answers submitted in Part VI (Hazard Description) of EPA Form T2070-2 or observations warrant a more thorough site investigation/sampling, please attach a sketch map showing those areas of concern. (i.e.: lagoons, leachate seeps, drum storage, monitoring wells, etc.).

III. Please list site contacts and accompanying inspectors; include name, title and phone numbers:

Eric Schauffer, Landfill Manager, DSWA

Andrew Bullen, Solid Waste Branch, DNREC

IV. Site observations: (attach a topo map).

A. Population within 1000 ft. of the site is (CIRCLE ONE)

(1) 0-10 people
2. 10-100 people
3. greater than 100 people

B. List surrounding land use: (wood lot, agricultural, playground, industrial, etc.).

North: sludge druing lagoons from WWTP

South: ICI Americas, marsh

East: Delaware River

West: Penn Central Railroad, Holloway Terrace (residential)

ORIGINAL (Red)

C. Water supply for area. (CIRCLE ONE)

1. Surface intakes (locate on attached map)
2. Municipal wells (locate on map)
3. Domestic wells:
   a. Approximate number within 1/4 mile. None
   b. Locate a minimum of 3 wells on attached map and list below:

Property owner	_____	_____	_____
Address	_____	_____	_____
Phone No.	_____	_____	_____
Well records	YES___ NO___	YES___ NO___	YES___ NO___
Odor Problems	YES___ NO___	YES___ NO___	YES___ NO___
Taste Problems	YES___ NO___	YES___ NO___	YES___ NO___

   c. If odor or taste problems are reported please elaborate: _____

D. Are surface or subsurface, (leachate), drainage areas from site apparent? YES___ NO X. If yes:

1. Were unusual odors or stains noted? YES___ NO X
2. Was stressed vegetation noted? YES___ NO X

E. Are streams or receiving waters adjacent to site? YES X NO___
If yes, list observations: (i.e. - change in benthic community, change in plant density/diversity, change in color, siltation, etc.). Pigeon Point is located along the Delaware River. No leachate has entered the Delaware River since the county completed the eastern leachate collection system in late 1979.

F. Site topography: (i.e. - plateau, strip mine ravines, etc.). A built-up plateau of dredge spoils and waste material along the Delaware River

G. Other observations: (i.e. - erosion, located in flood plain, etc.). Some erosion noted on the east side of landfill where cover was not vegetated.

V. Were photographs taken? YES X NO ___
If yes: Who has custody of photographs?

ORIGINAL (Red)

Name: _____

Agency: Solid Waste Branch - DNREC

Phone No.: 302-736-4781

VI. Is a hydrogeological survey for this site attached? YES ___ NO X
If no, Section III D of EPA Form T2070-2 must be completed.

VII. Please attach pertinent copies of reports or data reviewed by inspector: (i.e. - State monitoring data, consultant reports, etc.).

VIII. Name of Inspector: Andrew Bullen

Agency: Solid Waste Branch - DNREC

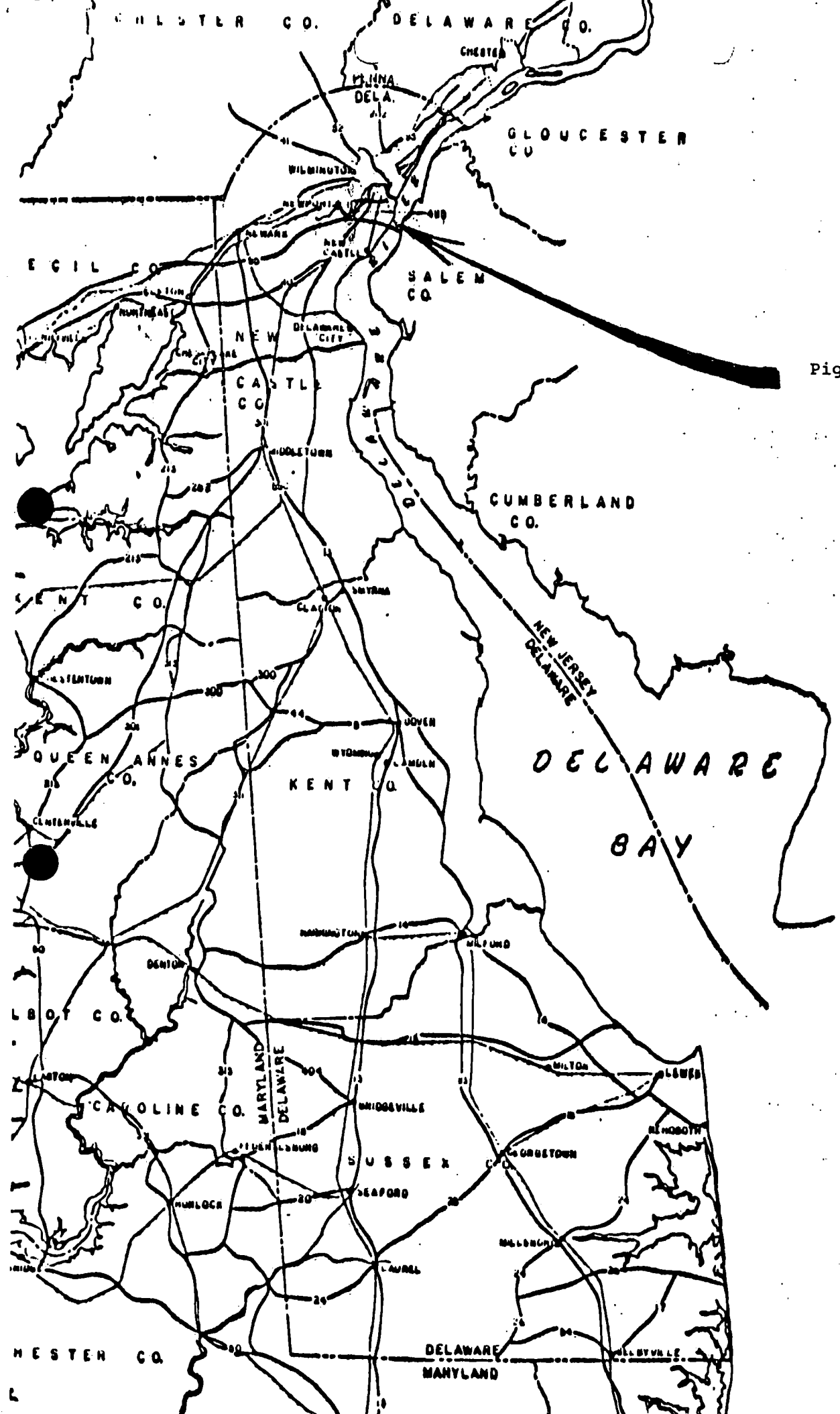
Phone No.: 302-736-4781

Time on Site: 10:00 - 11:30 a.m. 3/22/84

Weather Conditions: 50°F partly cloudy

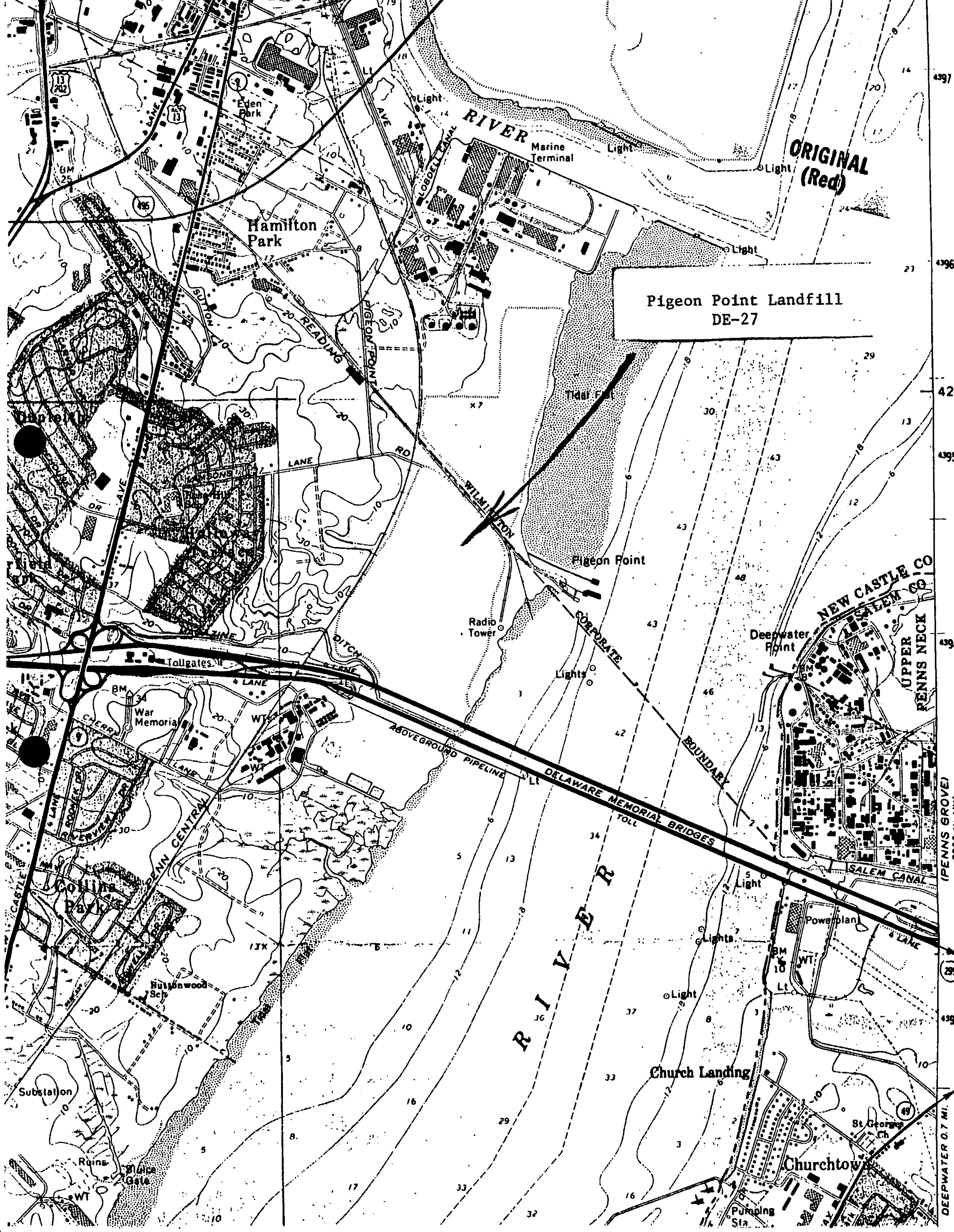
ORIGINAL
(Red)

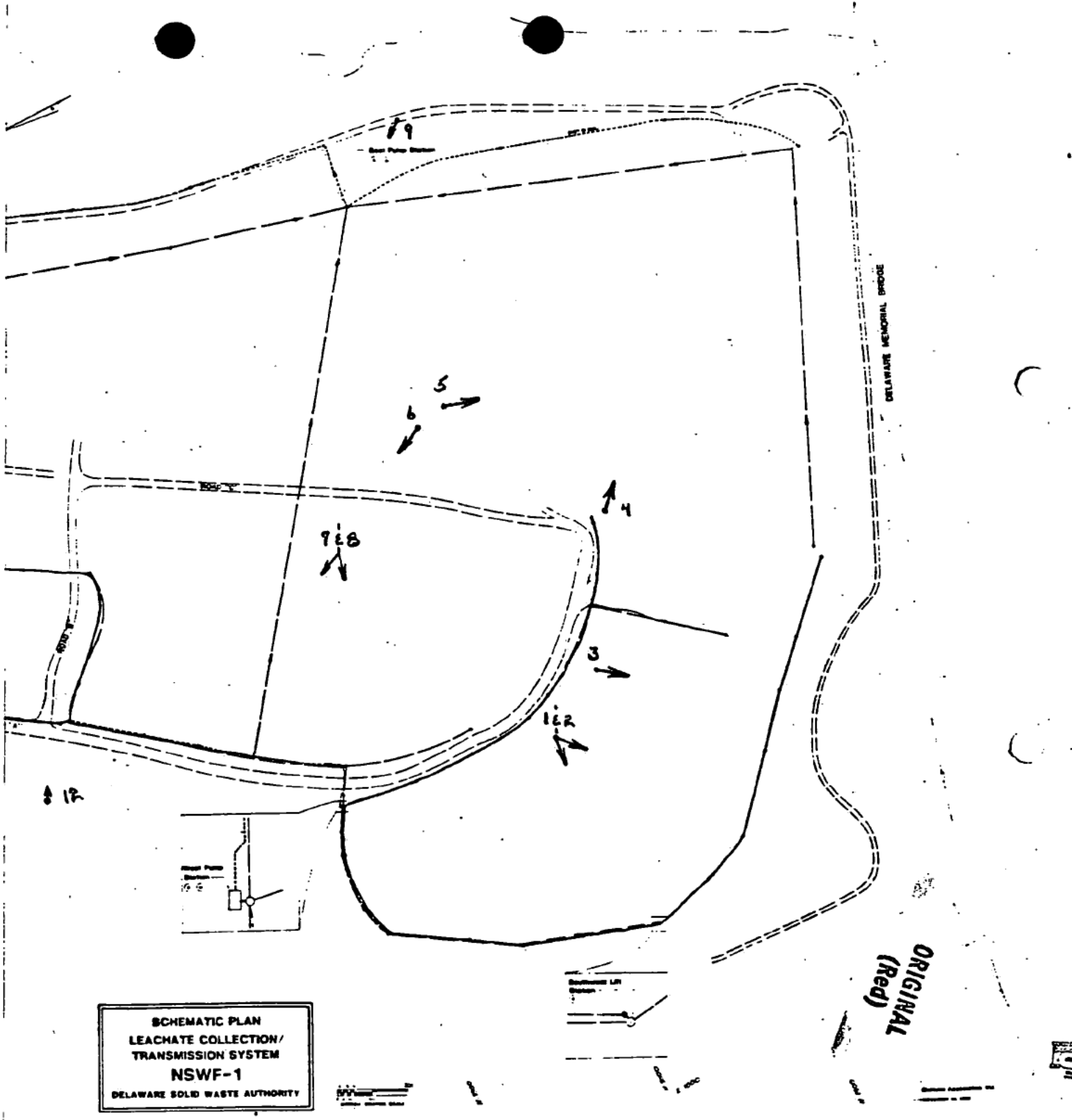
VI. Maps and Drawings



ORIGINAL
(Red)

Pigeon Point Landfill
DE-27


Pigeon Point Landfill
DE-27
ORIGINAL
(Red)
RIVER
Marine
Terminal
Light
Eden
Park
Hamilton
Park
LOBDELL CANAL
READING
PIGEON POINT
WILMINGTON
Tidal Flat
Pigeon Point
Radio
Tower
Lights
CORPORATE
BOUNDARY
Tollgates
4 LANE
BM
34
War
Memorial
CHERRY
LANE
RIVERVIEW
PENN CENTRAL
ABOVEGROUND PIPELINE
DELAWARE MEMORIAL BRIDGES
TOLL
DITCH
LANE
RD
R I V E R
NEW CASTLE CO
SALEM CO
Deepwater
Point
UPPER
PENNS NECK
SALEM CANAL
(PENNS GROVE)
Powerplant
WT
Church Landing
St Georges
Ch
Churchtown
Pumping
Sta
DEEPWATER 0.7 MI.
Collins
Park
Buttonwood
Sch
Substation
Ruins
Sluice
Gate


DELAWARE MEMORIAL BRIDGE
9
5
6
4
7 & 8
3
1 & 2
12
SCHEMATIC PLAN
LEACHATE COLLECTION/
TRANSMISSION SYSTEM
NSWF-1
DELAWARE SOLID WASTE AUTHORITY
ORIGINAL
(Red)

SCHEMATIC PLAN
LEACHATE COLLECTION/
TRANSMISSION SYSTEM
NSWF-1
DELAWARE SOLID WASTE AUTHORITY

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(Red)

VII. Photographs

Photographs

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#1 and #2

Typical waste and debris on active face. This waste is covered daily.

#3

Typical humus produced at the landfill's recovery plant. This humus will be mixed with a Type G (heavy silt-clay subsoil) fill, then applied as daily cover to the landfill.

#4

Typical Type G fill used for landfill cover.

#5

Final cover with vegetated surface in the background.

ORIGINAL (Red)

#6

Final cover with active fill in the background.

#7

Paint sludge mixed with fill on an active face.

#8

Small quantity waste disposal area.

#9

East pump station for the east leachate collection system (see map).

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#10

Final section of the leachate collection system under construction. Note snythetic liner which is placed under the perforated PVC lines. This section will be completed in mid-April, 1984 (seemap).

#11

Close up of the synthetic liner.

#12

Humus produced at the recovery plant.

VIII. References

Reference

ORIGINAL (Red)

1. "A Preliminary Assessment of Pigeon Point Landfill; New Castle, Delaware" Ecology and Environment, Inc., Field investigation team, Region III, EPA, 1980.

2. "A Geological Assessment of Pigeon Point Landfill" Ecology and Environment, Inc. Region III EPA, 1980.

3. "Report on Pigeon Point Landfill, New Castle, Delaware", Alton Day Stone, Ecology and Environment, Inc., Region III EPA, 1980.

4. Landfill files, Water Resources Section, Delaware Dept. of Natural Resources and Environmental Control.

5. Solid Waste files, Solid Waste Management Branch, Delaware Dept. of Natural Resources and Environmental Control.

6. Erik Schaffer, Delaware Solid Waste Authority, March, 1982.

7. Jim Rohrbach, Delaware Solid Waste Authority, February, 1984.

8. Kenneth Weiss, Delaware Dept.of Natural Resources and Environmental Control, Solid Waste Branch, April, 1984.

9. Michael Apgar, Delaware Dept.of Natural Resources and Environmental Control, Water Resources Section, April 11, 1984.

Appendix A

DUFFIELD ASSOCIATES
Consulting Geotechnical Engineers

BOX 505
NEWARK, DELAWARE 19711
302-738-0703

June 18, 1981

Mr. P. S. Canzano, P. E.
Chief Engineer
Delaware Solid Waste Authority
P. O. Box 455
Dover, DE 19901

W. O. 260-B
RE: Northern Solid Waste Facility-1
Quarterly Water Level Data

Dear Mr. Canzano:

For your information, we are transmitting water level elevation data, measured on 26 through 28 May 1981 during performance of groundwater sampling for routine quarterly monitoring. These are presented on the enclosed table. The table summarizes these data based on geologic strata and, as such, can be used to evaluate piezometric potential or groundwater head conditions within successive strata. In general the observed piezometric level within the Columbia (Pleistocene) Formation and Potomac Formation sands are lower than those observed for the overlying marsh/hydraulic fill stratum, which contains the water-table. Typically, the water-table appears to be above elevation +10 ft.; while the observed piezometric level within the Pleistocene sand is below elevation +5 ft., and the general level within the larger sand strata of the Potomac Formation appears to be below sea level. These data indicate a downward flow gradient from the water-table to the underlying formations. Also, these data suggest potential southwesterly flow within the Pleistocene and southeasterly flow within the Potomac.

As we have previously discussed, the build-up of a water mound within the refuse fill is probable. This mound, which has not been verified due to the lack of centrally located observation wells, would have hydraulic continuity with the groundwater beneath the fill and would, therefore, represent the water-table. This would result in radial groundwater flow from the mound (i.e. fill area) toward the site perimeter. Although primarily a perimeter system, the water-table observation well data do indicate a mound-like water-table configuration. Those wells, located in closest proximity to the refuse fill (e.g. Ob. Wells 1, 31A, 37), indicate higher water-table positions--(greater than elevation +13 ft.), while the wells, located nearest perimeter discharge areas (e.g. Ob. Wells 28A, 29A, 41, and 42A), indicate lower levels (less than elevation +11 ft.).

ORIGINAL (Red)

These data also suggest the potential for vertical flow within the marsh/hydraulic fill stratum. Piezometric levels, indicated by observation wells screened in deeper zones, are lower than those observed in adjacent shallower wells. This can be illustrated by comparing elevation differences between Wells 32A (shallow) and 32 (deep), and 42 (shallow) and 42A (deep). This difference indicates a downward gradient through the stratum. As discussed above, this downward gradient is continued in the underlying Pleistocene and Potomac sands. In general, there appears to be potential hydraulic continuity from the landfill, through the marsh/hydraulic stratum, to these underlying formations. The potential for leachate migration into the deeper formations by this vertical flow is partially offset, but not eliminated, by the low permeability of the clayey silt sediments of the marsh/hydraulic fill stratum.

The enclosed table should be suitable for submission to the Department of Natural Resources and Environmental Control in fulfillment of the State permit (SW-75/01) requirement No. 9 for water level monitoring. The Department has deleted, by its letter of 22 December 1980, the requirement for a potentiometric map of the water-table aquifer. The Department also indicated a willingness to discuss the need for preparation of a Potomac potentiometric map. It is our opinion that, because of formation non-homogeneity and the limited information available a Potomac map would not be accurate.

If you have any questions regarding the above, please contact us.

Very truly yours,

DUFFIELD ASSOCIATES, INC.

non responsive based on revised scope

non responsive based on revised scope, P. E.

GKE/JMB:ch
Enc. Table

L8ca Pigeon Point G.W. elevations

GROUNDWATER LEVEL ELEVATION*
Northern Solid Waste Facility-1

ORIGINAL (Red)

	Date					
	Feb. 1981	May 1981	Sept. 1981	Dec. 1981	Feb. 1982	May 1982
Recent Deposits & Dredge Spoils						
(Water Table Wells)						
1	13.0 ft.	13.6 ft.	13.5 ft.	13.1 ft.	12.9 ft.	12.9 ft.
28A	11.7 ft.	10.4 ft.	10.2 ft.	13.0 ft.	13.55 ft.	12.5 ft.
29A	9.3 ft.	10.5 ft.	8.8 ft.	10.7 ft.	11.15 ft.	9.9 ft.
31A	15.5 ft.	16.2 ft.	15.7 ft.	16.3 ft.	16.2 ft.	16.8 ft.
32A	12.9 ft.	12.8 ft.	12.1 ft.	13.0 ft.	13.2 ft.	12.7 ft.
37	13.2 ft.	15.5 ft.	15.1 ft.	14.0 ft.	13.85 ft.	15.55 ft.
39	10.8 ft.	10.7 ft.	10.6 ft.	10.9 ft.	10.85 ft.	10.55 ft.
41	1.2 ft.	1.5 ft.	0.9 ft.	1.0 ft.	2.2 ft.	2.55 ft.
42	9.6 ft.	9.7 ft.	8.0 ft.	9.8 ft.	10.2 ft.	9.35 ft.
51 40						14.65 ft.
(Deeper Zone Wells)						
24	0.4 ft.	0.9 ft.	0.8 ft.	---	---	---
32	11.9 ft.	12.5 ft.	12.9 ft.	13.6 ft.	13.3 ft.	12.9 ft.
37A	11.2 ft.	11.4 ft.	13.4 ft.	12.6 ft.	12.5 ft.	13.2 ft.
42A	8.5 ft.	9.1 ft.	8.0 ft.	8.4 ft.	8.9 ft.	8.8 ft.
Pleistocene Sands						
1A	3.8 ft.	4.3 ft.	4.0 ft.	3.9 ft.	4.2 ft.	4.5 ft.
25	3.5± ft.	3.8± ft.	**	**	**	**
25(R)				0.8 ft.	3.45 ft.	1.8 ft.
27	0.3± ft.	0.1± ft.	**	**	**	**
27(R)				0.25 ft.	2.75 ft.	3.25 ft.
50						4.5 ft.
Potomac Sands						
26	-3.7± ft.	---	**	**	**	**
26(R)				-1.35 ft.	-0.3 ft.	-1.2 ft.
28	-1.3± ft.	-3.3 ft.	-0.5 ft.	-0.4 ft.	0.05 ft.	0.4 ft.
29	-3.9 ft.	-5.3 ft.	-4.0 ft.	-2.8 ft.	-2.75 ft.	-4.8 ft.
31	3.2 ft.	3.4 ft.	3.3 ft.	3.2 ft.	5.0 ft.	4.65 ft.
41A	-0.7 ft.	0.0 ft.	0.2 ft.	-0.3 ft.	0.3 ft.	0.95 ft.
45						43± ft.
Interior (Base of) Landfill						
46						32.9 ft.
47						49.25 ft.
48						17.25 ft.
49						

* N.G.S. 1929 Sea Level Datum

** Observation Well Abandoned

W. O. 115 June 27, 1980

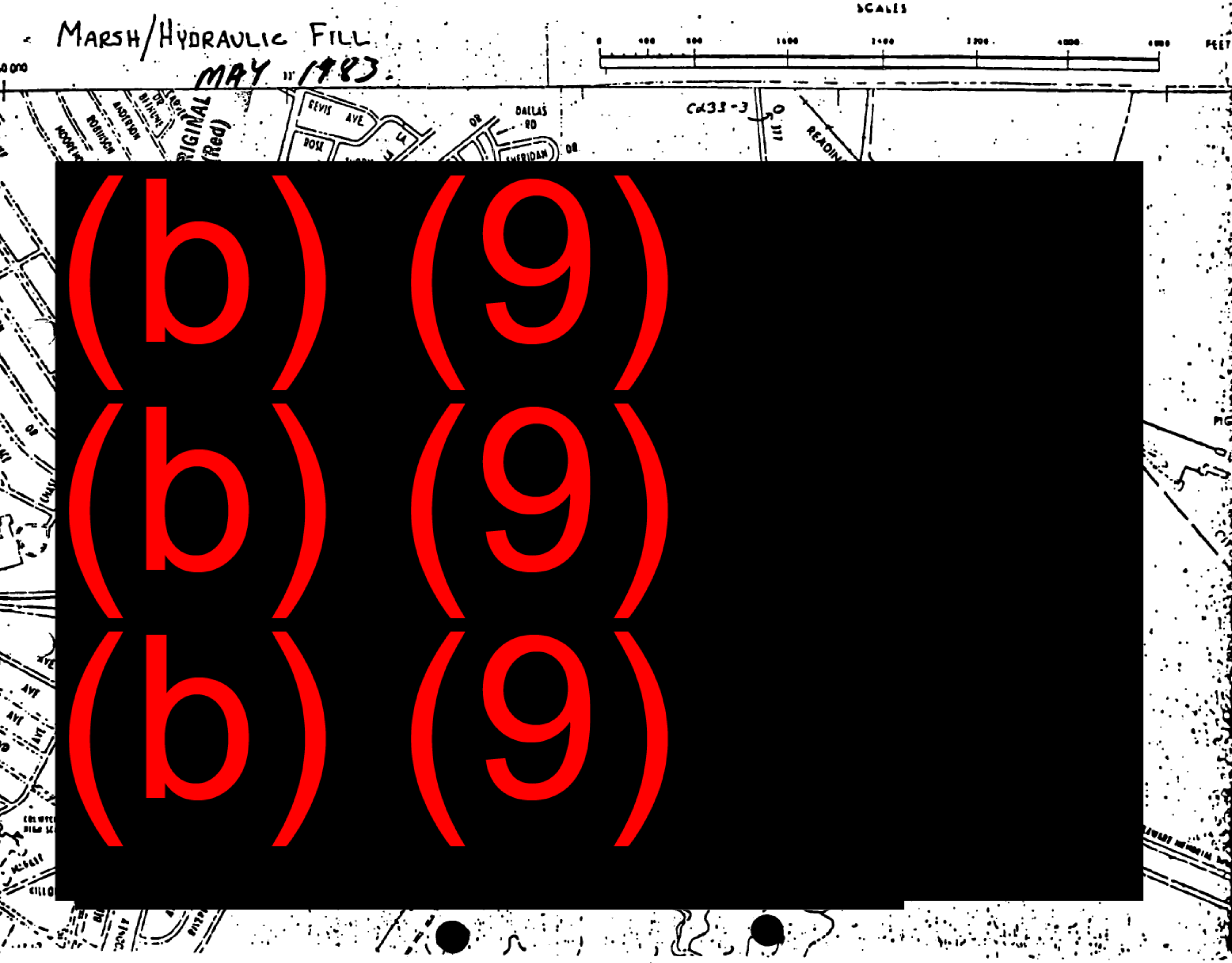
Construction Summary
OPERATIONAL MONITOR WELLS
Pigeon Point Landfill

ORIGINAL (Red)

Monitor Well Identification	Installation Date	Elevation (N.G.S. datum) Surface (Approx.)	Top of Casing	Screen Bottom	Probable Formation
1	Mar. 1976	21 ft.	23.4 ft.	6.0 ft.	Marsh/Hydraulic Fill
1A	May 1980	21 ft.	22.7 ft.	- 9.8 ft.	Columbia (Pleistocene)
24	May 1975	30 ft.	31.1 ft.	-68 ± ft.	Marsh & "Basal Gravel"
aban. — 25	Apr. 1975	--- (Not Surveyed) ---			Columbia
aban. — 26	May 1975	--- (Not Surveyed) ---			Potomac (Cretaceous)
aban. — 27	May 1975	--- (Not Surveyed) ---			Columbia
28	Mar. 1976	16 ft.	17.8 ft.	-35.4 ft.	Potomac
28A	May 1980	16 ft.	17.8 ft.	1.2 ft.	Marsh/Hydraulic Fill
29	Mar. 1976	14 ft.	17.6 ft.	-35.8 ft.	Potomac
29A	May 1980	14 ft.	15.8 ft.	- 0.8 ft.	Marsh/Hydraulic Fill
31	Mar. 1976	23 ft.	26.6 ft.	-40.1 ft.	Potomac
31A	May 1980	22.5 ft.	24.6 ft.	7.5 ft.	Hydraulic Fill/Marsh
32	Mar. 1976	15 ft.	18.8 ft.	-11.5 ft.	Marsh
32A	May 1980	19.5 ft.	21.3 ft.	3.2 ft.	Hydraulic Fill/Marsh
37	May 1980	18.5 ft.	20.6 ft.	4.0 ft.	Hydraulic Fill/Marsh
37A	May 1980	19 ft.	20.6 ft.	-21.6 ft.	Potomac
39	May 1980	14 ft.	15.9 ft.	- 0.7 ft.	Marsh/Hydraulic Fill
41	May 1980	23 ft.	24.9 ft.	- 1.6 ft.	Marsh/Hydraulic Fill
41A	May 1980	23 ft.	25.0 ft.	-32.3 ft.	Potomac
42	May 1980	18 ft.	19.9 ft.	1.8 ft.	Marsh/Hydraulic Fill
42A	May 1980	18 ft.	19.8 ft.	-22.2 ft.	Marsh

Marsh/Hydraulic Fill

May 11 1983



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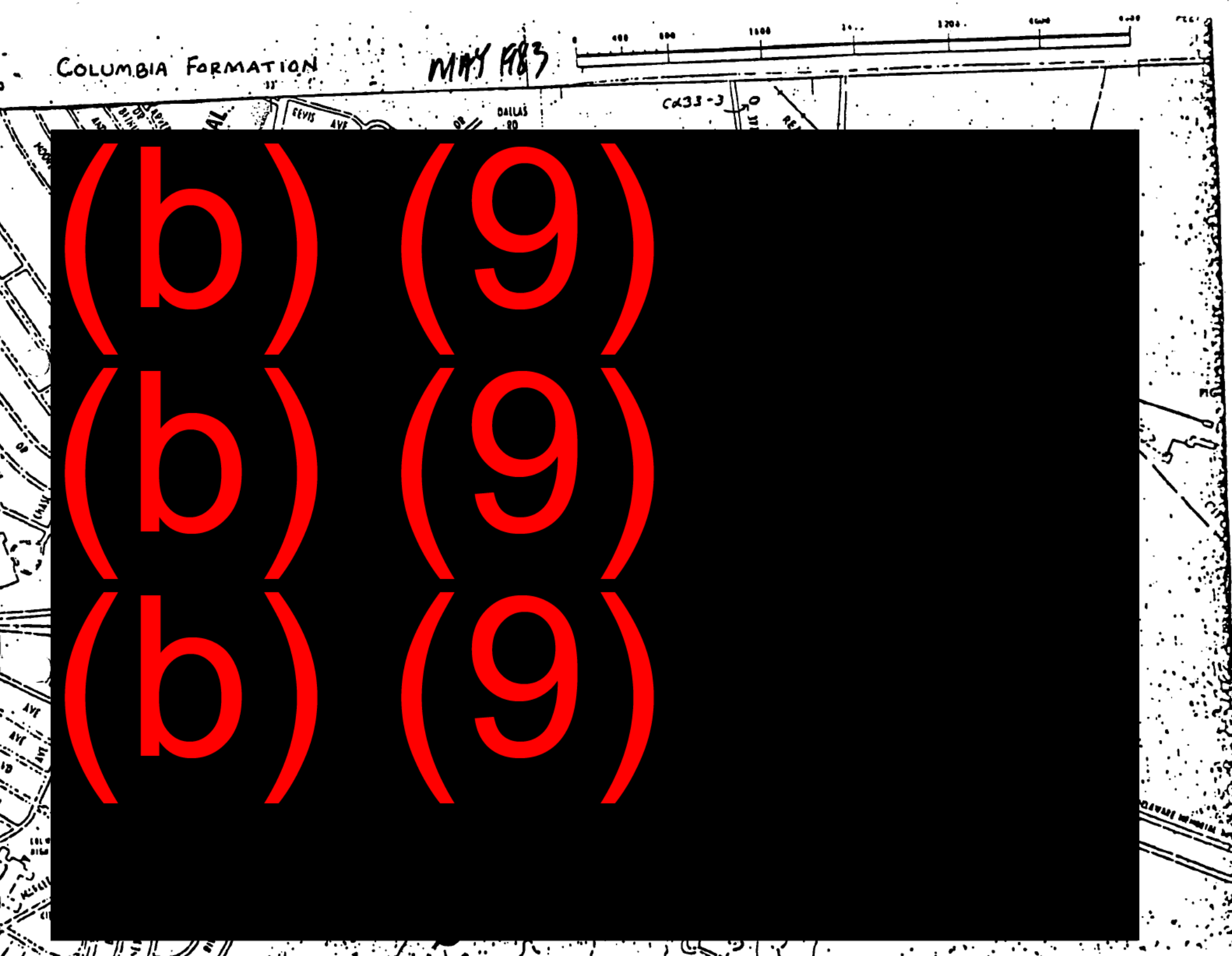
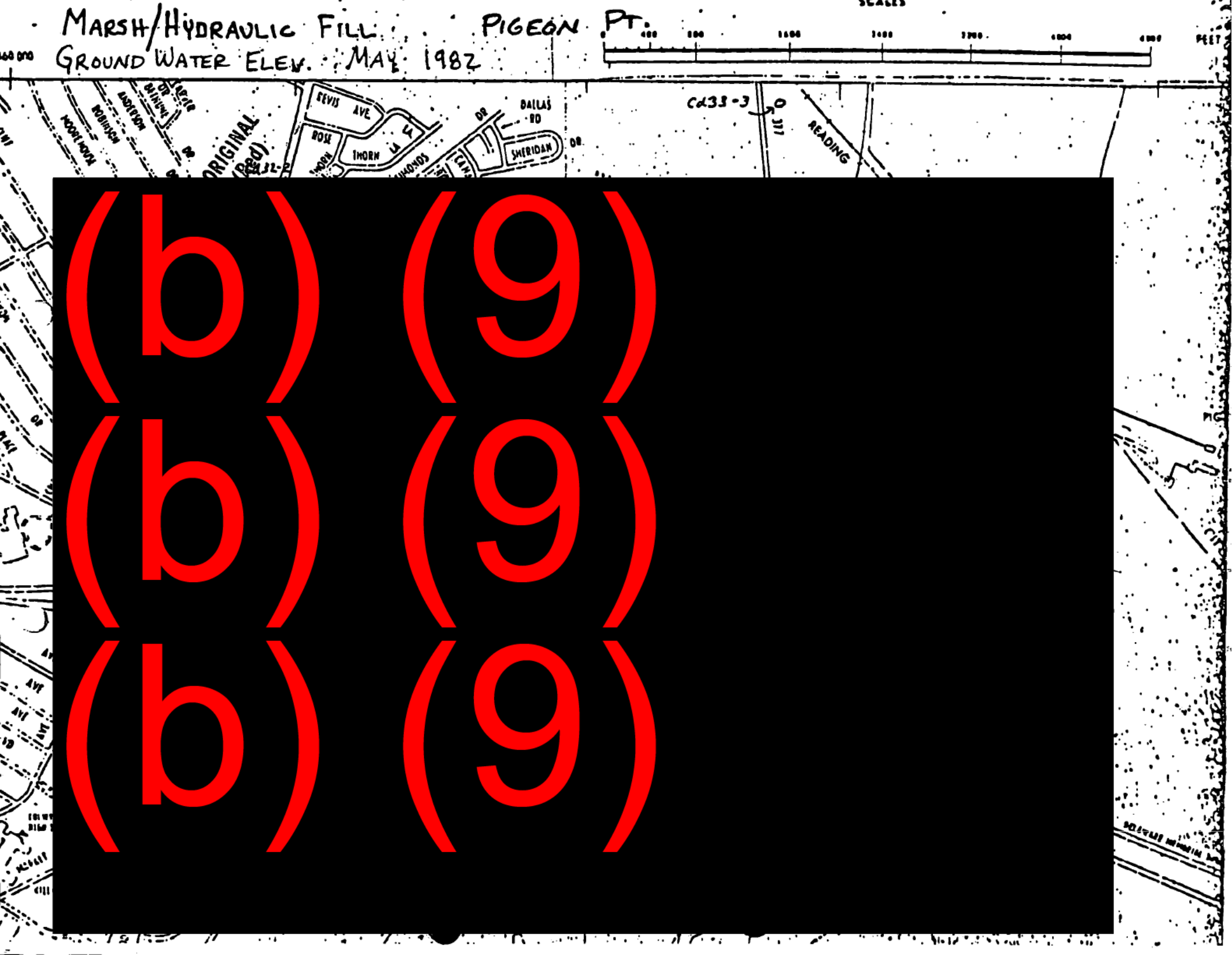
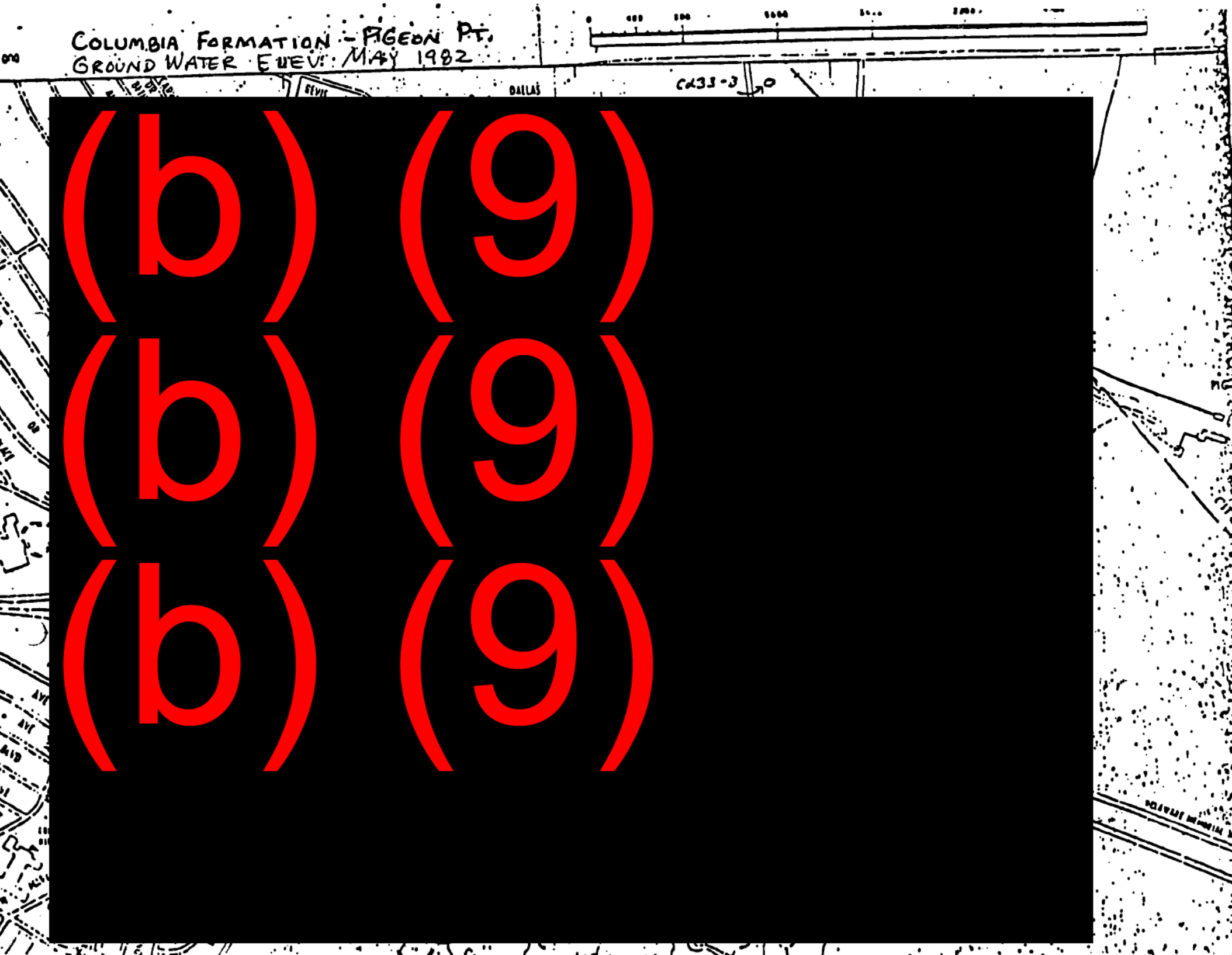

COLUMBIA FORMATION
MAY 1983
C433-3
DALLAS RD
(b) (9)
(b) (9)
(b) (9)


MAY, 1983
POTOMAC FORMATION
SCALES
(b) (9)
(b) (9)
(b) (9)


MARSH/HYDRAULIC FILL
GROUND WATER ELEV. MAY 1982
PIGEON PT.
SCALES
DAILAS RD
SHERIDAN
READING
(b) (9)
(b) (9)
(b) (9)


COLUMBIA FORMATION - PIGEON PT.
GROUND WATER ELEV: MAY 1982
DALLAS
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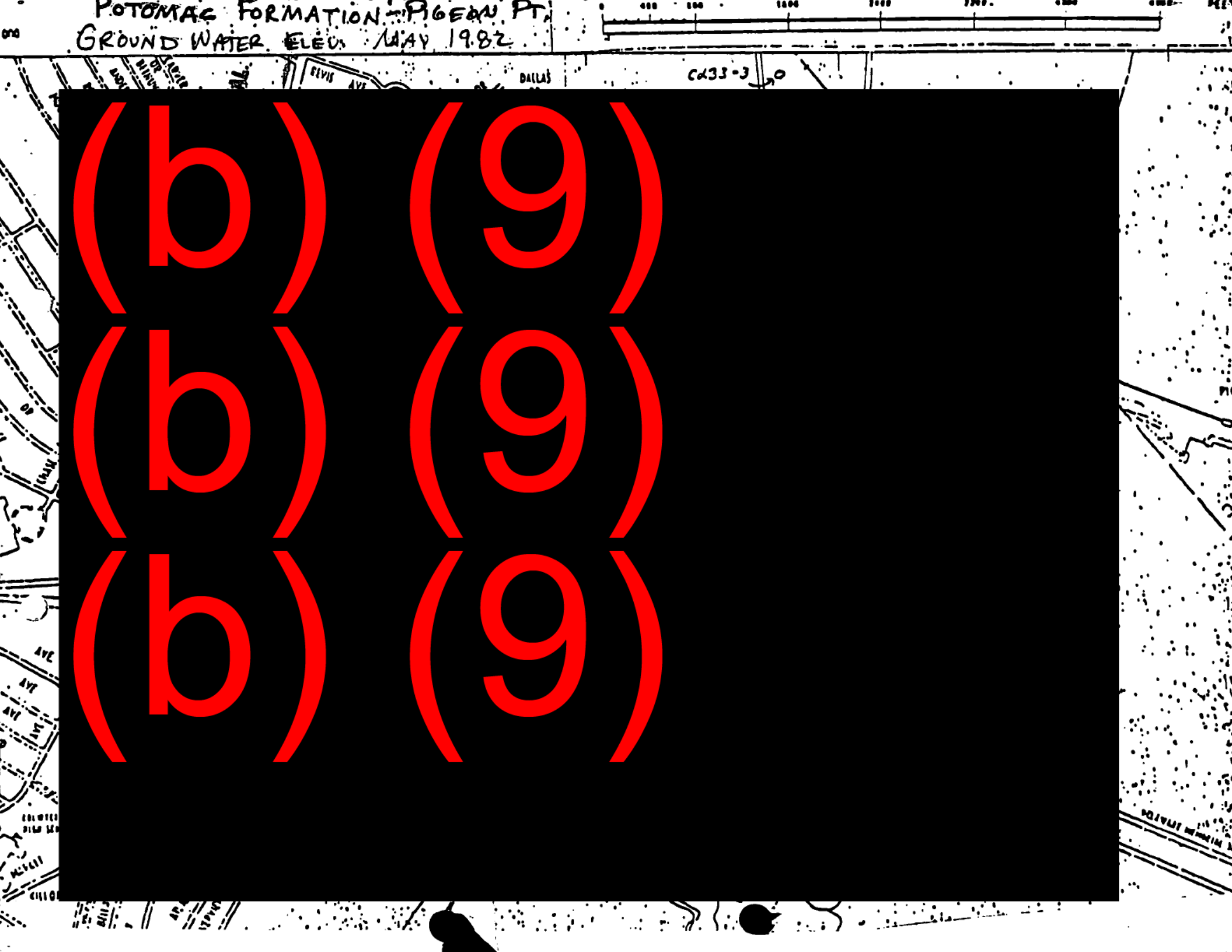
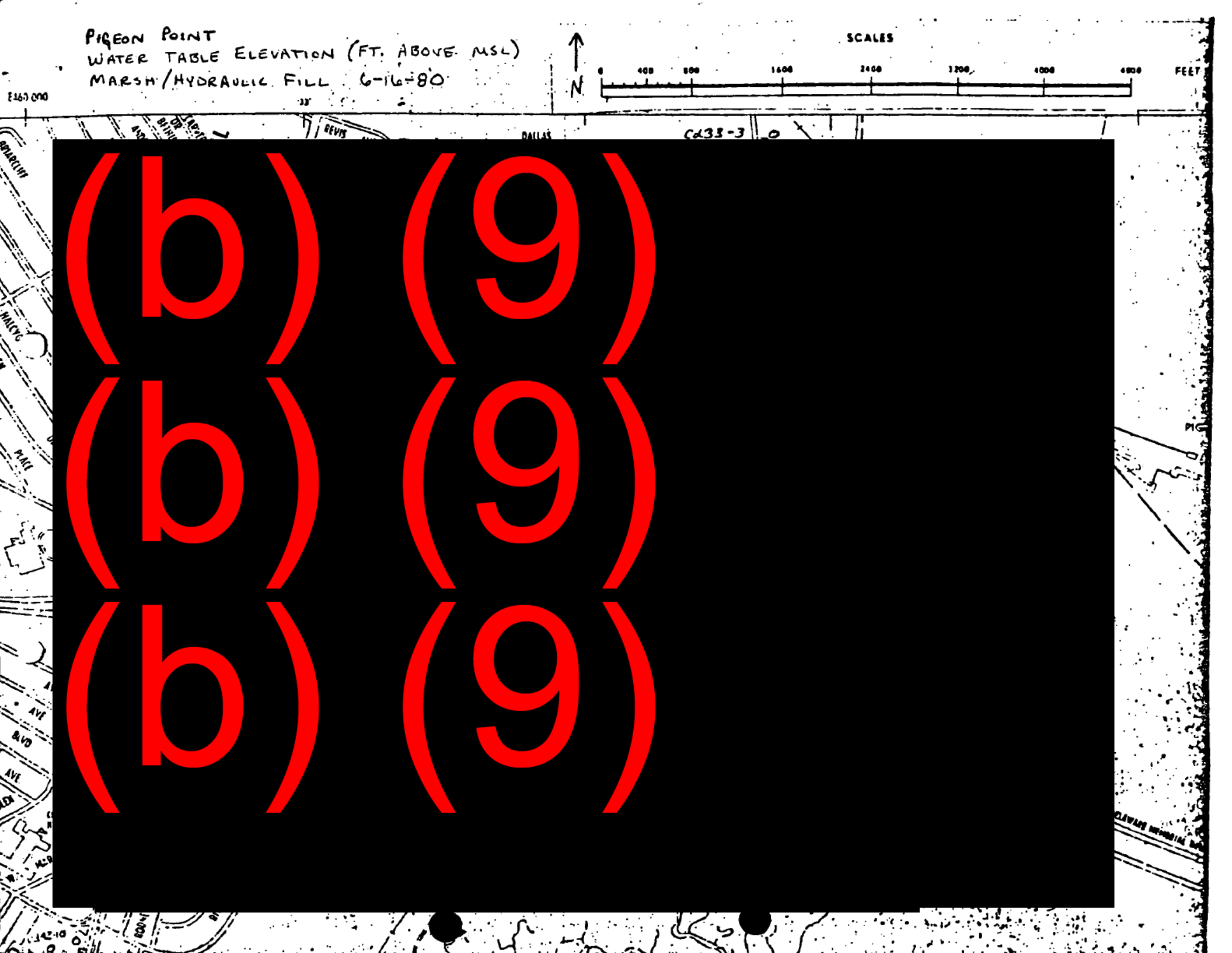
(b) (9)


POTOMAC FORMATION - PIGEON PT.
GROUND WATER ELEV. MAY 1982
(b) (9)
(b) (9)
(b) (9)


PIGEON POINT
WATER TABLE ELEVATION (FT. ABOVE MSL)
MARSH/HYDRAULIC FILL 6-16-80
N
SCALES
FEET
(b) (9)
(b) (9)
(b) (9)


PIGEON POINT
WATER TABLE ELEVATION (FT. ABOVE MSL)
MARSH/HYDRAULIC FILL 6-16-80
SCALES
N
0
400
800
1600
2400
3200
4000
4800
FEET
DALLAS
CA33-3
(b) (9)
(b) (9)
(b) (9)


PIGEON POINT
WATER TABLE ELEVATIONS (FT. ABOVE MSL)
COLUMBIA FM. 6-16-80
E460,000
SCALES
N
400
800
1600
2400
3200
4000
4800
FEET
GEVIS AVE
DALLAS RD
Cd33-3
(b) (9)
(b) (9)
(b) (9)


WATER TABLE ELEVATIONS (FT. ABOVE MSL)
POTOMAC FM. 6-16-80
E460 000
REVIS AVE
DALLAS RD
C433-3
(b) (9)
(b) (9)
(b) (9)

ORIGINAL (Red)

OUFFIELD ASSOCIATES, INC.

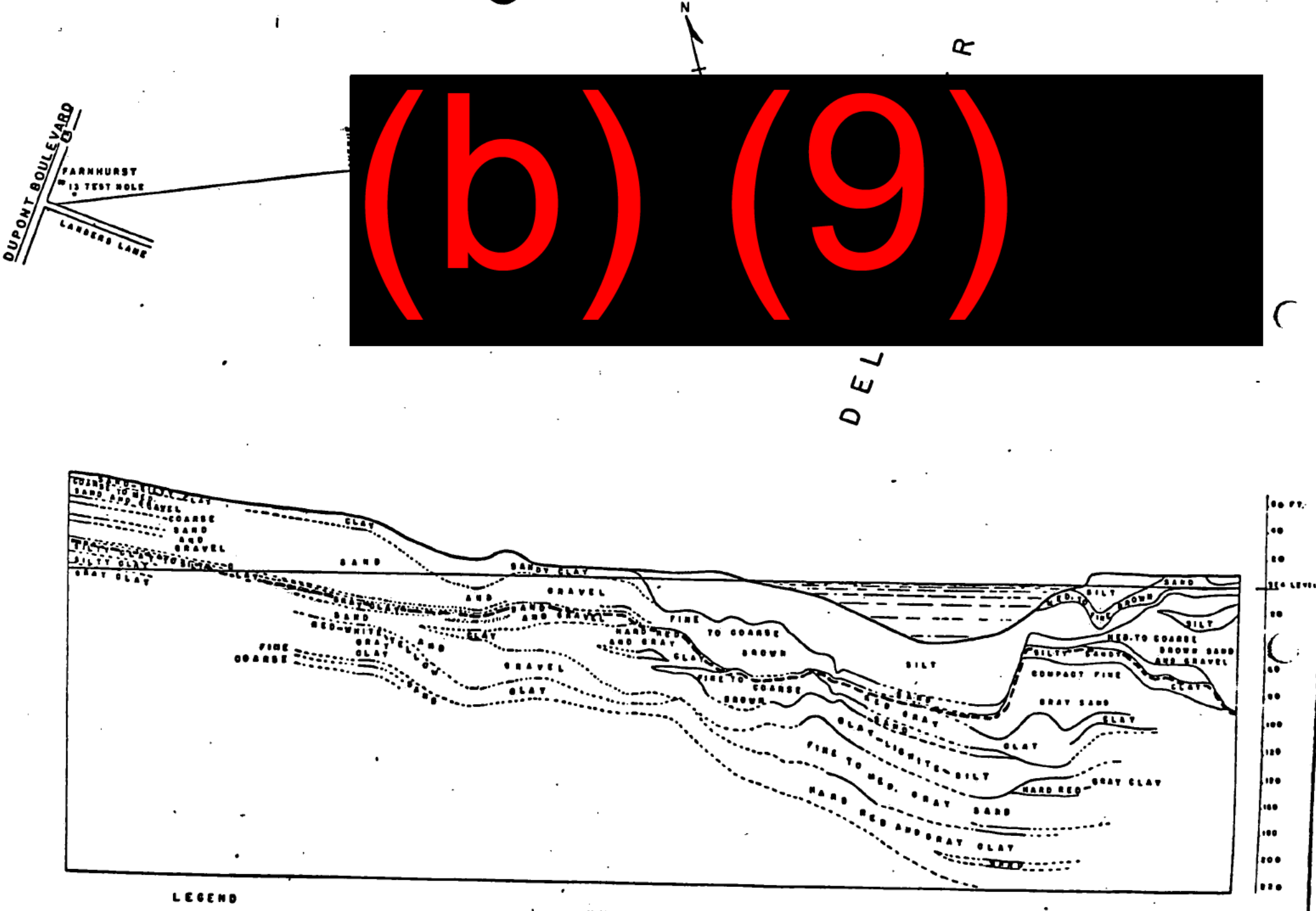
Consulting Geotechnical Engineers

Water Level Field Data Sheet

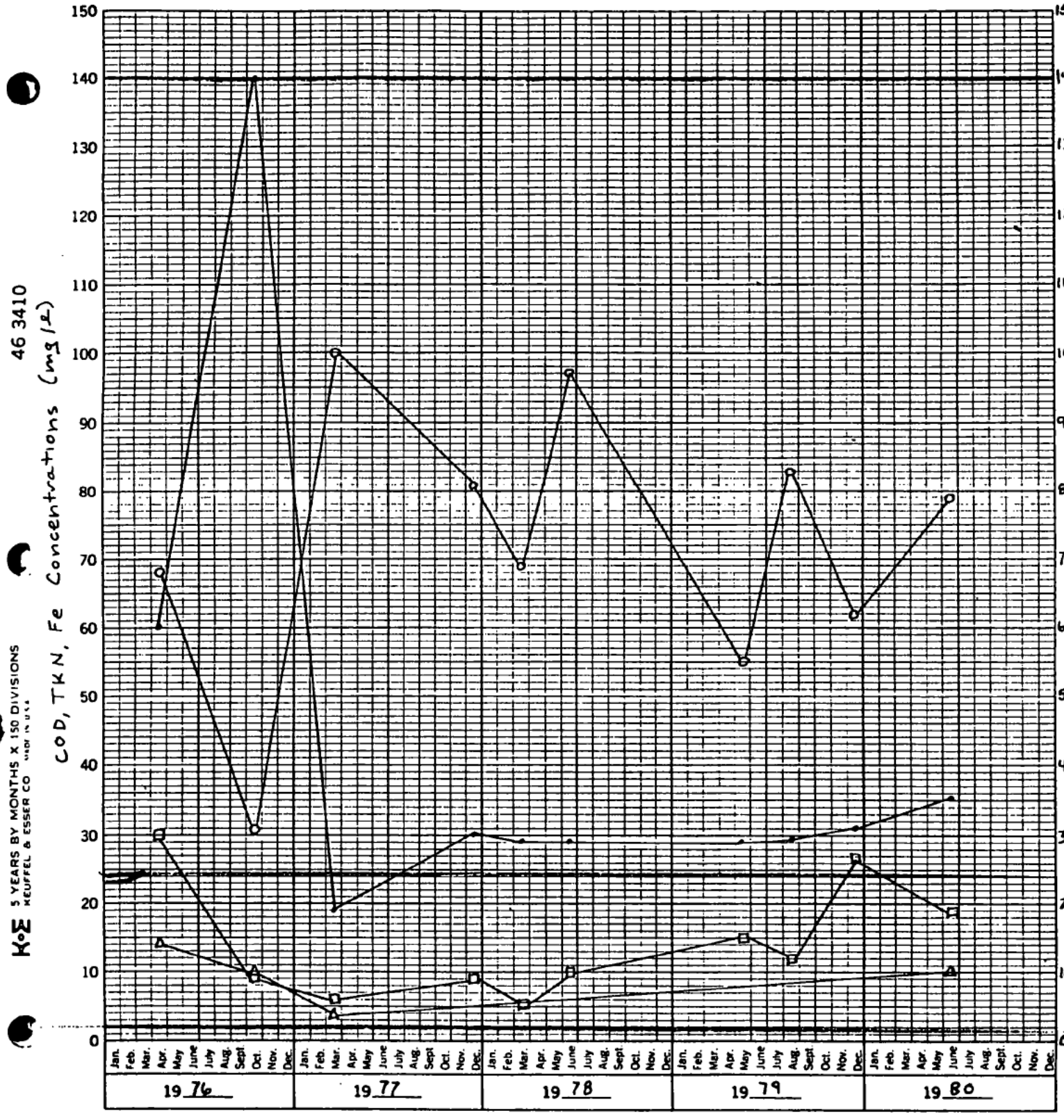
Project Pig Pt. W. O. No. 115

Date 6/16-6/19/80 Page 1 of 1 Tested by T.T.R. Calc. by G.K.E. Checked by

M. P. No.	T.O.C. Ref. Elev.	T.O.C. Water Depth	Water Elev.	T.O.C. Bott. Depth	Bott. Elev.	Stick Up	Dia. of Pipe	Remarks
1	23.4	10.3	13.1	17.4	6.0			Marsh / Hydraulic Fill
1A	22.7	18.4	4.3	32.5	-9.8			Columbia (Pleist.)
24	31.1	30.9	0.2	96.5 ±				Marsh + "Basal Gravel"
25								Columbia
26								Potomac (Creta.)
27								Columbia
28	17.8	19.0	-1.2	53.2	-35.4			Potomac
28A	17.8	6.1	11.7	16.6	1.2			Marsh / Hydraulic Fill
29	17.6	25.1	-7.5	53.4	-35.8			Potomac
29A	15.8	5.3	10.5	16.6	-0.8			Marsh / Hydraulic Fill
31	26.6	22.9	3.7	66.7	-40.1			Potomac
31A	24.6	8.7	15.9	17.1	7.5			Hydraulic Fill / Marsh
32	18.8	6.3	12.5	30.3	-11.5			Marsh
32A	21.3	8.6	12.7	18.1	3.2			Hydraulic Fill / Marsh
37	20.6	5.3	15.3	16.6	4.0			Hydraulic Fill / Marsh
37A	20.6	9.1	11.5	42.2	-21.6			Potomac
39	15.9	5.0	10.9	16.6	-0.7			Marsh / Hydraulic Fill
41	24.9	23.3	1.6	26.5	-1.6			Marsh / Hydraulic Fill
41A	25.0	25.3	-0.3	57.3	-32.3			Potomac
42	19.9	10.0	9.9	18.1	[redacted]			Marsh / Hydraulic Fill
42A	19.8	10.1	9.7	42.0	[redacted]			Marsh



ICI U.S. Geo. X-section at
Pg. Pt.



O COD
Δ TKN
□ Fe
• Cl

PIGEON POINT LANDFILL

WELL 28 - POTOMAC

-Cl background at Area A

-Fe

-TKN

-COD